



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

[Handwritten signature]

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/820,911

04/08/2004

Michael E. Littau

31162-11-US

8761

5179

7590

11/02/2004

PEACOCK MYERS AND ADAMS P C

P O BOX 26927

ALBUQUERQUE, NM 871256927

EXAMINER

STOCK JR, GORDON J

ART UNIT

PAPER NUMBER

2877

DATE MAILED: 11/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/820,911

Applicant(s)

LITTAU ET AL.

Examiner

Gordon J Stock

Art Unit

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-77 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 43-77 is/are allowed.
- 6) ☒ Claim(s) 1-42 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 4/8/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. **Claims 1-28, 32, 33, 35-42** are rejected under 35 U.S.C. 102(b) as being anticipated by **Littau et al (6,429,930)**.

As for **claims 1-28, 32, 33, 35-42**, Littau discloses the following in a determination of center of focus by diffraction signature analysis: providing a substrate, a wafer, comprising a plurality of fields with each field having been exposed at differing exposure and focus conditions and comprising a plurality of single period diffraction gratings formed on the substrate through a lithographic process; measuring the diffraction signature for each of a plurality of the diffraction structures in a plurality of fields (column 7, lines 1-20) by means of a radiation source-based tool such as a light source based tool that may be an incident laser beam source with scanning through a plurality of incident angles (column 8, lines 45-50; column 4, lines 55-65; column 5, lines 1-20); determining for each field the variability of measured diffraction signatures obtained from the plurality of diffraction surfaces located within the field; and comparing variabilities associated with the fields to determine a desired parameter (column 7, lines 5-15); the system may be an angle-resolved scatterometer (column 4, lines 55-65); a plurality of laser sources may be used (column 8, lines 45-50); a broad spectral light source may be used with a range of wavelengths (column 4, lines 62-65); the S and P polarizations amplitude and phase may be

Art Unit: 2877

varied with variable phase detection (column 5, lines 1-5); a variable sweep or variable angle of incidence may be used with a broad or narrow wavelength light source (column 5, lines 8-15); the diffraction signature may be reflective, transmissive, specular, higher order and scatter is measured via scatterometry (column 8, lines 30-65; column 9, lines 1-10); the desired parameters may be dose and center of focus (column 6, lines 65-67; column 7, lines 1-20) ; the desired parameter is determined through the minimal variability; a statistical measure such as root mean square error is performed (column 11, lines 5-15); whereas, the effect of dose on exposure is found (column 13, lines 5-10); a library of theoretical diffraction signatures are used (column 13, lines 34-40); a chosen feature is CD (column 2, lines 15-30) ; latent imagery is used (column 9, lines 40-55); the center of focus is determined and adjusted with computer control and autofocus based on predetermined values versus the variability determined (column 14, lines 5-15).

3. **Claims 1-5, 8, 12-14, 19-22, 25-31, 37-39** are rejected under 35 U.S.C. 102(b) as being anticipated by **Singh et al (6,501,534)**.

As for **claims 1-5, 8, 12-14, 19-22, 25-31, 37-39**, Singh in an automated periodic focus and exposure calibration of a lithography stepper discloses the following: providing a test wafer comprising a plurality of fields, each field having been exposed at a different focus value and comprising a plurality of single period diffraction gratings formed on the substrate by a lithographic process; measuring a reflective diffraction signature for each of a plurality of single period diffraction gratings in a plurality of fields (column 4, lines 1-50) by means of a radiation source-based tool, a laser or plurality of laser sources (column 6, lines 28-40; column 5, lines 52-54); determining for each field the variability of measured diffraction signatures obtained from the plurality of diffraction structures located within that field and comparing the variabilities

Art Unit: 2877

with a golden standard to determine desired parameters of the lithography device (column 7, lines 55-67; column 8, lines 1-10); phase measurement by a laser with variable sweep may be used (column 5, lines 45-65; column 6, lines 42-60; column 7, lines 10-20); with multiple wavelength discrete wavelength source from the range of wavelengths used with lasers (Figure 6); scatter is measured (column 5, lines 50-51); center of focus and dose are parameters (column 8, lines 5-10); different focus settings and dose settings are used (column 5, lines 35-45); whereas, adjustments are made from the deviation from the golden standard, a library of theoretical data, through calibration (column 8, lines 1-20). The system has computer control and autofocus (Fig. 2: focus control and processor).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claims 29-31 and 34** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Littau et al (6,429,930)**.

As for **claims 29-31, and 34**, Littau discloses everything as above (see **claims 27 and 33**). He is silent concerning standard deviation, cross section area, cross section volume, or a product of two features. However, he discloses that well known metrics are used (column 4, lines 1-10). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the system have standard deviation for standard deviation is a well known statistical method for analyzing data and to determine its accuracy. Littau also states that profile

Art Unit: 2877

and CD may be found (column 2, lines 15-30). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the system found cross section area, cross section volume, or a product of two, for the system finds a profile and CD; whereas, volume and area are profile features and volume is the product of area and height profiles.

Allowable Subject Matter

6. **Claims 43-77** are allowed.

As to **claim 43**, the prior art of record, taken alone or in combination, fails to disclose or render obvious a method of process control in a lithography device comprising the particular steps of exposing and comparing, in combination with the rest of the limitations of **claims 43-77**.

Fax/Telephone Numbers

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and

2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: (703) 872-9306

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (571) 272-2431.

The examiner can normally be reached on Monday-Friday, 10:00 a.m. - 6:30 p.m.


Art Unit: 2877

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached at 571-272-2800 ext 77.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private Pair system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


gs

October 26, 2004


Zandra V. Smith
Primary Examiner
Art Unit 2877